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Medical Surveillance Monthly Report

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Army Medical Surveillance Activity (AMSA)

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Data in the MSMR are provisional, based on reports and other sources of data available to the Army Medical Surveillance Activity. Notifiable events are reported by date of onset (or date of notification when date of onset is absent). Only cases submitted as confirmed are included.

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Surveillance Trends

Hyponatremia Associated with Heat Stress and Excessive Water Consumption: The Impact of Education and a New Army Fluid Replacement Policy

In September 1997, the MSMR summarized the US Army's experience with regard to hyponatremia associated with heat stress and excessive water consumption ("overhydration/hyponatremia").[1] In the same issue, results of an epidemiologic investigation of a cluster of severe cases of overhydration/hyponatremia, along with recommendations to reduce the risk of this preventable, potentially life-threatening injury were reported.[2] In April 1998, the Army revised its fluid replacement guidelines to lessen the risk of overhydration/hyponatremia during military training in heat stressful conditions.[3] To assess potential impacts of increased awareness, enhanced prevention education efforts, and the fluid replacement policy change, rates of hospitalizations and outpatient visits of active duty soldiers for overhydration/hyponatremia were compared during similar periods prior to and subsequent to the new policy's implementation.

Methods: For the period January 1997 through September 1998, the Army Medical Surveillance Activity searched the inpatient and outpatient records of the Defense Medical Surveillance System (DMSS) to identify hospitalizations and outpatient visits of active duty soldiers and West Point cadets in which either the primary discharge diagnosis was "hyposmolality and/or hyponatremia" (ICD-9 code 276.1) or any of the discharge diagnoses (up to 8 for each hospitalization and 4 for each clinic visit) included both 276.1 and either "fluid overload" (ICD-9 code 276.6) or "effects of heat" (ICD-9 code 992.0 - 992.9). Incidence rates were calculated and compared for May through September of 1997 and 1998. The Poisson distribution was used to estimate 95% confidence bounds around subgroup-specific incidence rates.

General: Between January 1997 and September 1998, there were 57 soldiers/cadets with inpatient and/or outpatient records that met the surveillance case definition of overhydration/hyponatremia. Fifty-seven percent of all cases in both years were hospitalized. As expected, most cases occurred during the spring-summer months (figure 1): for example, 72% of 1997 cases and 84% of 1998 cases occurred between May and September. The Army-wide incidence rate during the spring-summer of 1998 was slightly lower than that during the spring-summer of 1997 (incidence rates, May-September 1997: 11.5/100,000 soldier-years; May-September 1998: 10.6/100,000 soldier-years).

Geographic: Of the 15 installations at which cases were identified (figure 2), three large southeastern posts — Fort Benning, Georgia; Fort Jackson, South Carolina; and Fort Polk, Louisiana — accounted for 78% of all cases in 1997 and 48% in

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1998. Fort Benning, the Army's infantry training center, accounted for 43% and 38% of all cases in 1997 and 1998, respectively.

Gender: Between 1997 and 1998, the incidence rate among males remained relatively stable (1997: 10.5/100,000 soldier-yrs; 1998: 11.8/100,000 soldier-yrs) while the rate among females significantly declined (1997: 17/100,000 soldier-yrs; 1998: 3.4/100,000 soldier-yrs).

Race/ethnicity: For this summary, soldiers were divided into six race/ethnicity-defined subgroups: "white nonhispanic," "black nonhispanic" "Hispanic," "Asian," "American Indian," and "others." In both years, rates among white nonhispanic soldiers (1997: 15.7/100,000 soldier-yrs; 1998: 13.4/100,000 soldier-yrs) significantly exceeded those among black nonhispanic soldiers (1997: 3.7/100,000 soldier-yrs; 1998: 3.8/100,000 soldier-yrs). There were two or fewer cases per year in each of the other racial/ethnic subgroups; as a result, subgroup-specific relative risks and incidence trends could not be reliably assessed.

Continued on page 8

Figure 1. Overhydration/hyponatremia cases, active duty soldiers, January 1997- September 1998

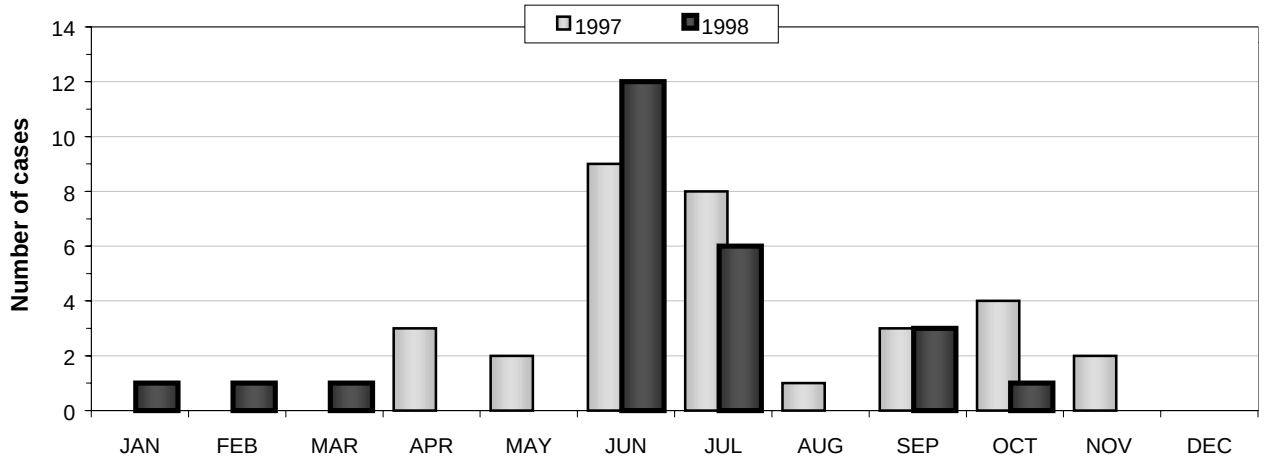


Figure 2. Overhydration/hyponatremia cases, spring-summer (May-Sep), by location of medical treatment facility, active duty soldiers, 1997-1998

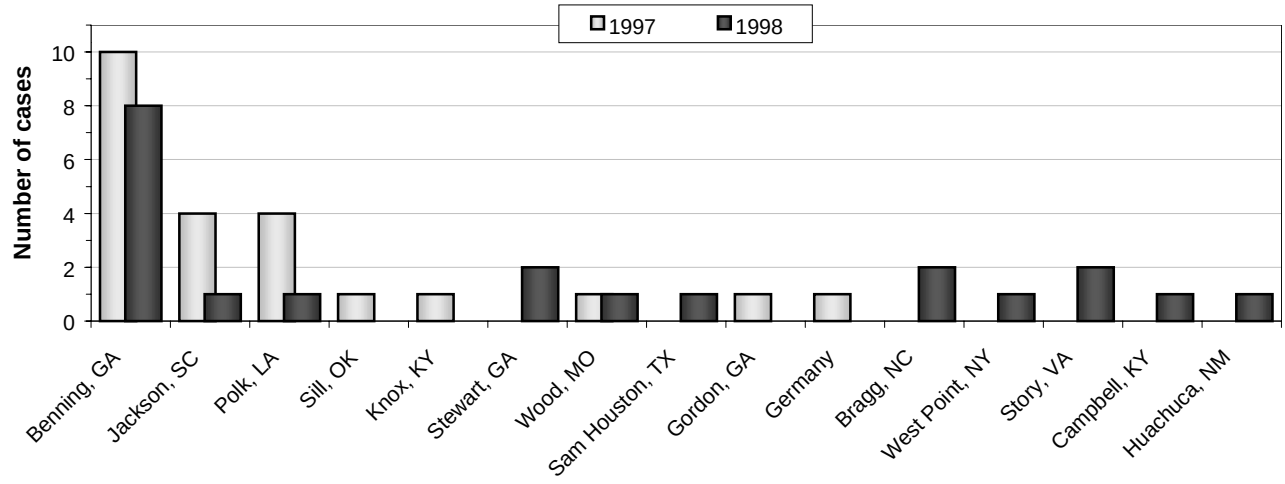


TABLE I. Selected sentinel reportable diseases, US Army medical treatment facilities* February, 1999

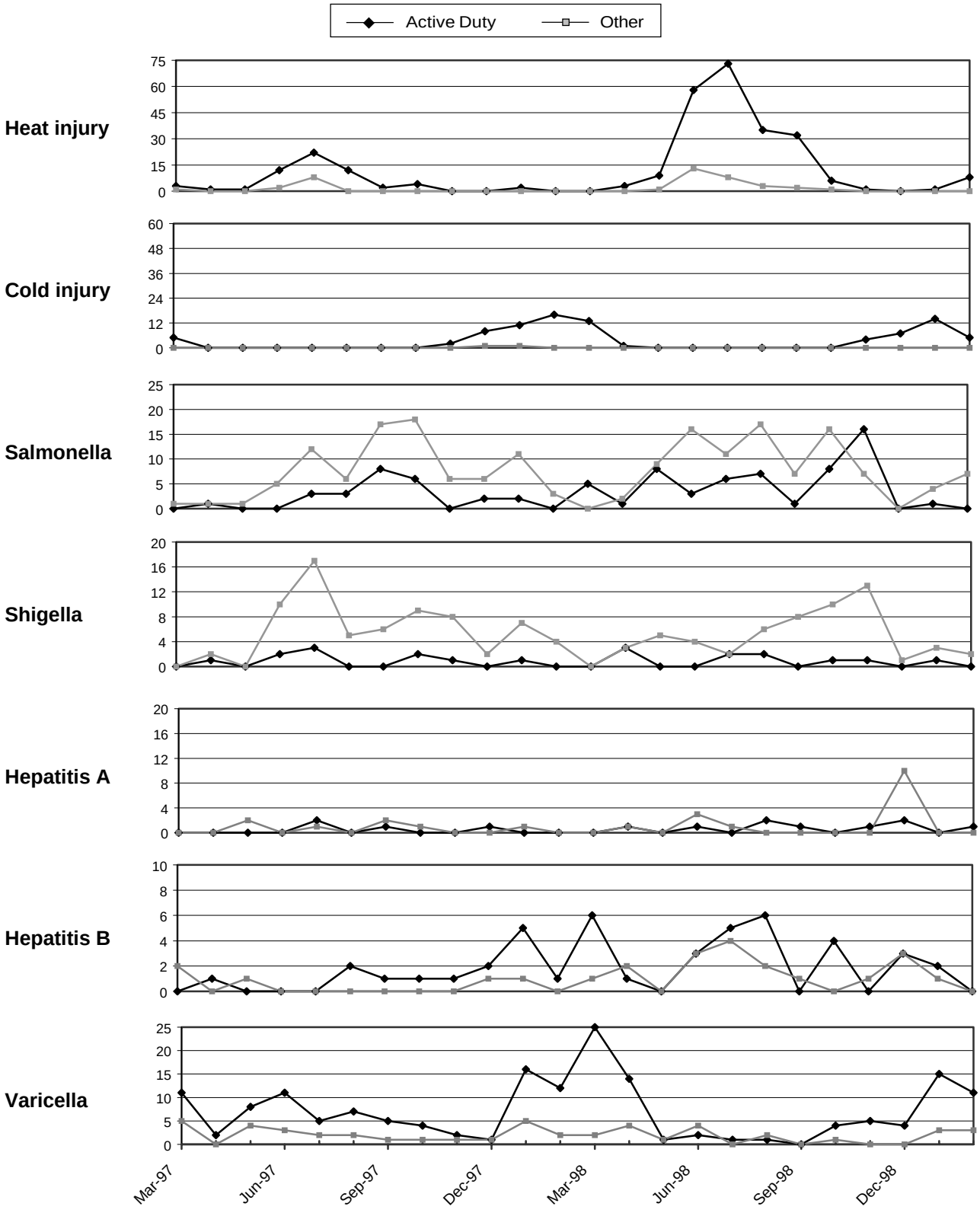
Reporting MTF/Post**	Total number of reports submitted February 1999	Environmental Injuries		Viral Hepatitis		Salmonellosis		Shigella		Varicella	
		Active Duty				Active Duty	Other	Active Duty	Other	Active Duty	Other Adult
		Heat	Cold	A	B						
		Cum. 1999	Cum. 1999	Cum. 1999	Cum. 1999	Cum. 1999	Cum. 1999	Cum. 1999	Cum. 1999	Cum. 1999	Cum. 1999
NORTH ATLANTIC RMC											
Walter Reed AMC	21	0	0	0	0	0	0	0	0	2	0
Aberdeen Prov. Ground, MD	5	0	0	0	0	0	0	0	0	1	0
FT Belvoir, VA	13	0	0	0	0	0	1	0	0	0	0
FT Bragg, NC	74	1	2	0	0	0	1	0	0	1	0
FT Drum, NY	3	0	6	0	0	0	0	0	0	2	1
FT Eustis, VA	22	0	0	0	0	0	0	0	0	1	0
FT Knox, KY	17	0	0	0	0	0	1	0	0	1	0
FT Lee, VA	9	0	0	0	0	0	0	0	0	0	0
FT Meade, MD	0	0	0	0	0	0	0	0	0	0	0
West Point, NY	1	0	0	0	0	0	0	0	0	0	1
GREAT PLAINS RMC											
Brooke AMC	80	0	0	0	2	0	1	0	4	1	1
Beaumont AMC	0	0	0	0	0	0	0	0	0	0	0
FT Carson, CO	22	0	0	0	0	0	0	0	0	0	0
FT Hood, TX	15	0	0	0	1	0	0	0	0	0	0
FT Huachuca, AZ	0	0	0	0	0	0	0	0	0	0	0
FT Leavenworth, KS	0	0	0	0	0	0	0	0	0	0	0
FT Leonard Wood, MO	11	0	1	0	1	0	0	0	0	2	3
FT Polk, LA	1	0	0	0	0	0	0	0	0	0	0
FT Riley, KS	15	0	0	0	0	0	0	0	0	0	0
FT Sill, OK	15	0	0	0	0	0	0	0	0	5	0
SOUTHEAST RMC											
Eisenhower AMC	14	0	0	0	0	0	0	0	0	0	0
FT Benning, GA	31	9	0	1	0	0	0	0	0	0	0
FT Campbell, KY	32	0	0	0	0	0	3	1	1	0	0
FT Jackson, SC	38	0	0	0	0	0	0	0	0	1	0
FT McClellan, AL	0	0	0	0	0	0	0	0	0	0	0
FT Rucker, AL	1	0	0	0	0	0	0	0	0	0	0
FT Stewart, GA	30	0	0	0	0	0	1	0	0	4	0
WESTERN RMC											
Madigan AMC	43	0	0	0	0	0	3	0	0	0	0
FT Irwin, CA	0	0	0	0	0	0	0	0	0	0	0
FT Wainwright, AK	3	0	14	0	0	0	0	0	0	0	0
OTHER LOCATIONS											
Tripler	46	0	0	0	0	1	0	0	0	0	0
Europe	26	0	1	0	2	0	1	0	0	7	0
Korea	6	0	7	0	1	0	0	0	0	0	0
Total	**594**	**10**	**31**	**1**	**7**	**1**	**12**	**1**	**5**	**28**	**6**

* Based on date of onset.

** Reports are included from main and satellite clinics. Not all sites reporting.

Date of Report: 7-Mar-99

FIGURE I. Selected sentinel reportable diseases, US Army medical treatment facilities*
Cases per month, Mar 97 - Feb 99



* Reports are included from main and satellite clinics. Not all sites reporting.

Date of report: 7-Mar-99

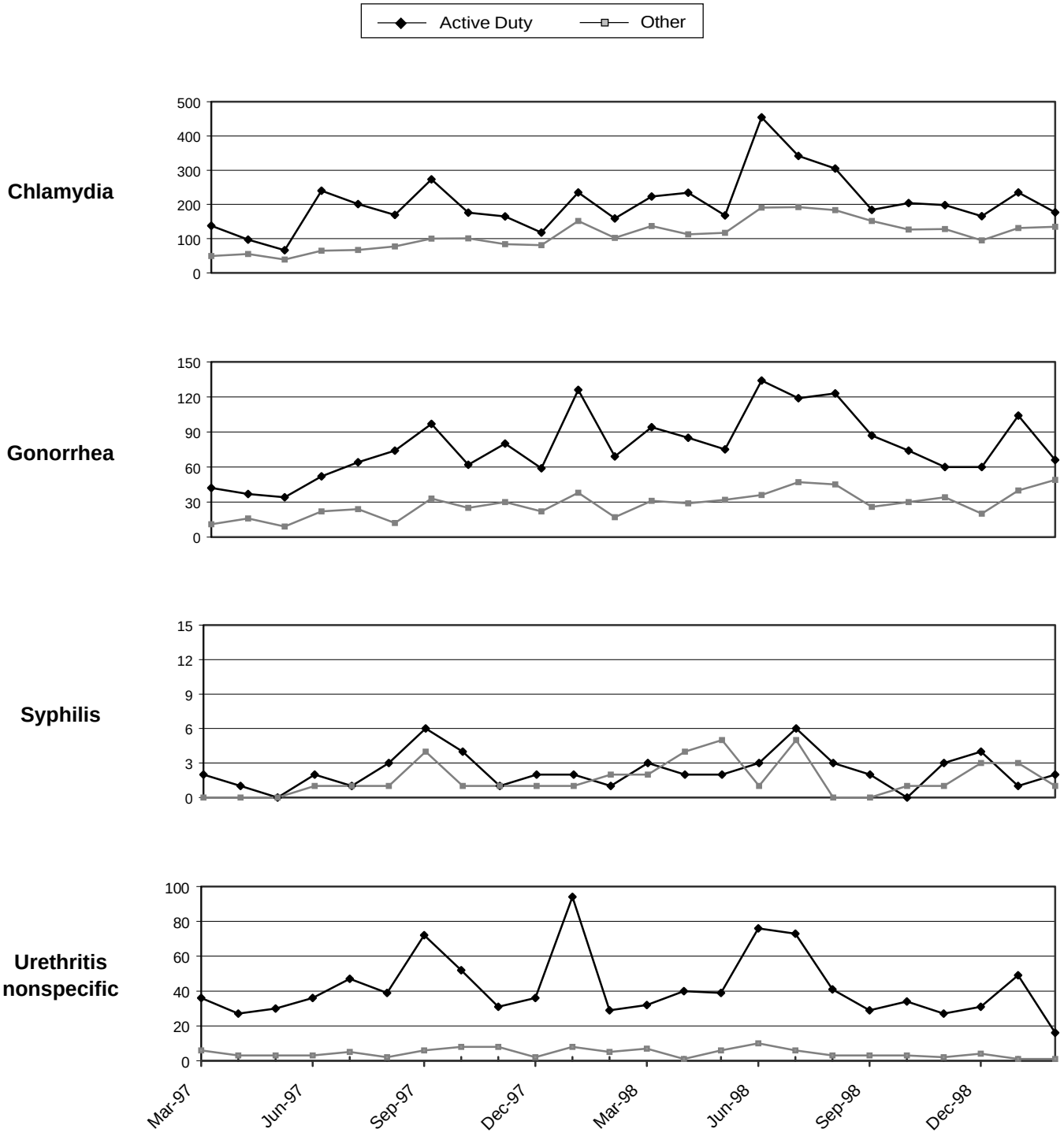
TABLE II. Reportable sexually transmitted diseases, US Army medical treatment facilities* February, 1999

Reporting MTF/Post**	Chlamydia		Urethritis non-spec.		Gonorrhea		Syphilis Prim/Sec		Syphilis Latent		Syphilis Tertiary		Syphilis Congenital	
	Cur. Month	Cum. 1999	Cur. Month	Cum. 1999	Cur. Month	Cum. 1999	Cur. Month	Cum. 1999	Cur. Month	Cum. 1999	Cur. Month	Cum. 1999	Cur. Month	Cum. 1999
NORTH ATLANTIC RMC														
Walter Reed AMC	5	18	1	1	1	3	0	0	0	0	0	1	0	0
Aberdeen Prov. Ground, MD	1	1	0	2	3	5	0	0	0	0	0	0	0	0
FT Belvoir, VA	7	17	0	0	4	7	0	0	0	0	0	0	0	0
FT Bragg, NC	50	100	0	0	21	46	0	0	0	0	0	0	0	0
FT Drum, NY	1	9	0	0	0	6	0	0	0	0	0	0	0	0
FT Eustis, VA	16	29	0	0	6	9	0	0	0	0	0	0	0	0
FT Knox, KY	9	18	0	0	6	13	0	0	0	0	0	0	0	0
FT Lee, VA	6	23	0	0	3	10	0	1	0	0	0	0	0	0
FT Meade, MD	0	3	0	0	0	0	0	0	0	0	0	0	0	0
West Point, NY	0	2	0	0	0	0	0	0	0	0	0	0	0	0
GREAT PLAINS RMC														
Brooke AMC	13	25	0	1	5	17	0	0	0	0	0	0	0	0
Beaumont AMC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FT Carson, CO	18	64	3	12	1	7	0	0	0	0	0	0	0	0
FT Hood, TX	11	45	0	13	4	21	0	1	0	0	0	0	0	0
FT Huachuca, AZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FT Leavenworth, KS	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FT Leonard Wood, MO	4	16	0	1	1	7	0	1	3	3	0	0	0	0
FT Polk, LA	1	13	0	0	0	5	0	0	0	0	0	0	0	0
FT Riley, KS	14	26	0	0	1	9	0	0	0	0	0	0	0	0
FT Sill, OK	8	28	2	7	2	18	0	0	0	0	0	0	0	0
SOUTHEAST RMC														
Eisenhower AMC	13	41	0	0	0	1	0	0	0	0	0	0	0	0
FT Benning, GA	5	19	0	0	12	26	0	1	0	0	0	0	0	0
FT Campbell, KY	19	47	0	0	9	20	0	0	0	0	0	0	0	0
FT Jackson, SC	32	71	0	0	5	7	0	1	0	0	0	0	0	0
FT McClellan, AL	0	1	0	0	0	0	0	0	0	0	0	0	0	0
FT Rucker, AL	1	4	0	0	0	1	0	0	0	0	0	0	0	0
FT Stewart, GA	17	22	5	24	5	12	0	0	0	0	0	0	0	0
WESTERN RMC														
Madigan AMC	26	75	6	18	8	12	0	0	0	0	0	0	0	0
FT Irwin, CA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FT Wainwright, AK	0	5	0	0	0	2	0	0	0	0	0	0	0	0
OTHER LOCATIONS														
Tripler	19	47	0	0	10	24	0	0	0	0	0	0	0	0
Europe	13	57	0	0	8	21	0	0	0	0	0	0	0	0
Korea	3	5	0	0	0	0	0	0	0	0	0	0	0	0
Total	**312**	**831**	**17**	**79**	**115**	**309**	**0**	**5**	**3**	**3**	**0**	**1**	**0**	**0**

* Reports are included from main and satellite clinics. Not all sites reporting.

Date of Report: 7-Mar-99

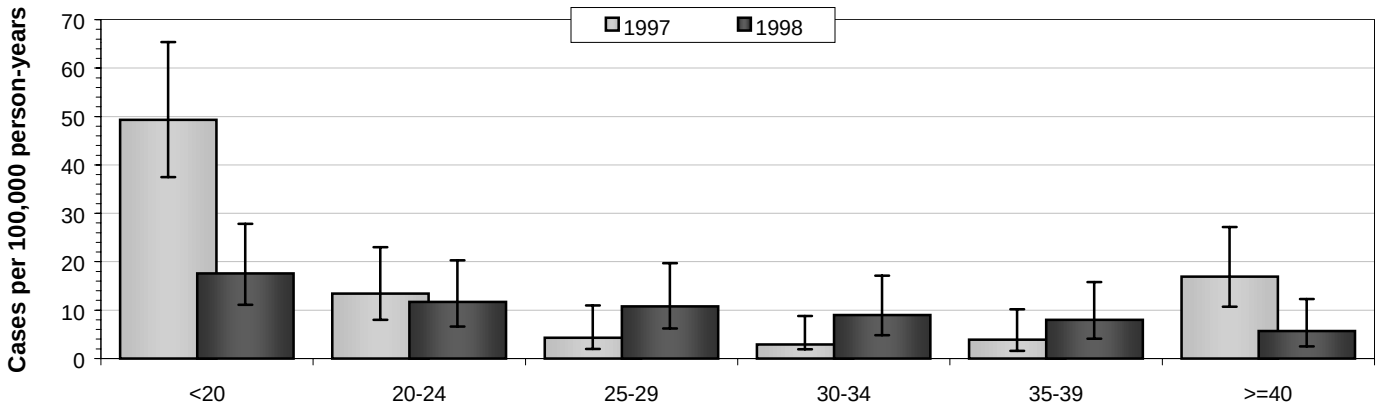
FIGURE II. Reportable sexually transmitted diseases, US Army medical treatment facilities*
Cases per month, Mar 97 - Feb 99



* Reports are included from main and satellite clinics. Not all sites reporting.

Date of report: 7-Mar-99

Figure 3. Overhydration/hyponatremia rates, by age groups, active duty soldiers, 1997-1998



Error bars indicate 95% confidence bounds based on the Poisson distribution.

Continued from page 3

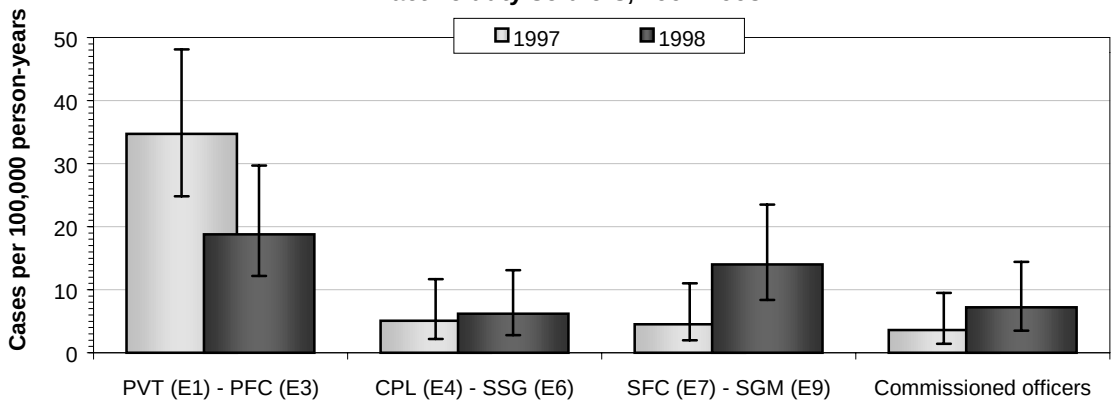
Age: In 1997, there was a "U-shaped" relationship between age and overhydration/hyponatremia risk (i.e., the highest rate was among the youngest soldiers while the next highest rate was among the oldest). In contrast, in 1998, age-specific rates decreased monotonically with age (i.e., the highest rate was among the youngest soldiers but the *lowest* rate was among the oldest). While teenaged soldiers were at the highest risk in both years, their overhydration/hyponatremia rates declined nearly two-thirds from 1997 to 1998 (figure 3).

Military grade: In both years, the highest rates of overhydration/hyponatremia were among soldiers in the lowest enlisted grades (figure 4). However, from 1997 to 1998, rates declined by more than half among the most junior enlisted soldiers but increased among more senior enlisted soldiers and among officers.

Editorial comment: In the spring of 1998, in an effort to prevent overhydration/hyponatremia cases while not increasing dehydration/heat injury risks, the Army revised its guidelines regarding fluid replacement in heat stressful conditions. Of particular note, the new guidelines limited fluid intake regardless of heat category or work level to no more than 1½ quarts hourly or 12 quarts daily (table).

The summer of 1998 was one of the hottest ever recorded in the United States. As a result, among active duty soldiers, heat-related (ICD-9-CM: 992) hospitalization and clinic visit rates were more than 45% higher in 1998 compared to 1997.[4] In contrast, during the same period, overhydration/hyponatremia rates declined slightly overall and by nearly two-thirds among the youngest and most junior soldiers

Figure 4. Overhydration/hyponatremia rates, by military grade, active duty soldiers, 1997-1998



Error bars indicate 95% confidence bounds based on the Poisson distribution.

— the subgroups who historically have been at highest risk.[1] These observations suggest that preventive interventions (including adherence to the new fluid replacement guidelines) may have been most effectively implemented and their impacts most clearly felt among soldiers in their initial courses of training (e.g., basic and advanced individual training). Finally, relatively small but consistent increases in rates among older aged and higher grade soldiers may reflect effects of one or more of the following: hotter outdoor temperatures, relative unawareness of or inattention to overhydration/hyponatremia risks and/or revised fluid replacement guidelines, and/or improved case ascertainment (e.g., better recognition by medical care providers of early clinical manifestations of water intoxication).[5]

In summary, overhydration/hyponatremia is a militarily relevant, potentially life threatening,[5] preventable heat-related injury. Nonetheless, injuries related to *dehydration* remain the most significant heat-associated threat to the health and military operational effectiveness of soldiers. In the US Army, overhydration/hyponatremia risks are greatest among "unseasoned" soldiers at training posts in the southeastern United States — particularly at Fort Benning, the Army's infantry training center. Current work-rest and fluid replacement guidelines were designed to protect soldiers in training from heat injury risks related to dehydration on the one hand and overhydration on the other. As the hot weather approaches, soldiers at all echelons should become familiar with and rigorously adhere to current Army and local heat injury prevention guidelines.

Report and editorial comment provided by Stephen C. Craig, LTC(P), MC, Epidemiology Program, Epidemiology and Disease Surveillance Directorate, USACHPPM.

References
1. USACHPPM. Hyponatremia secondary to heat stress and excessive water consumption: Fort Benning, Georgia; Fort Leonard Wood, Missouri; Fort Jackson, South Carolina, June-August 1997. *MSMR*, 1997, 3:6(September), 2.
2. USACHPPM. Hyponatremia secondary to heat stress and excessive water consumption: Outbreak investigation and recommendations. *MSMR*, 1997, 3:6(September), 9.
3. Memorandum, subject: Policy guidance for fluid replacement during training, Department of the Army, Office of the Surgeon General, dated 29 April 1998.
4. USACHPPM. Heat related outpatient visits, active duty soldiers, US Army, January 1997 - August 1998. *MSMR*, 1998, 4:7(October-November), 16.
5. Garigan, T, Ristedt, DE. Case report: Death from hyponatremia as a result of acute water intoxication in an Army basic trainee. *Mil Med*, 1999, 164:3(March), 234.

Fluid replacement policy for warm weather training
(Average acclimated soldier wearing battle dress uniform (BDU), hot weather)

		Easy Work		Moderate Work		Hard Work	
Heat category	WBGT Index. °F	Work/rest (min.)	Water intake (qt/hr)	Work/rest (min.)	Water intake (qt/hr)	Work/rest (min.)	Water intake (qt/hr)
1	78 - 81.9	NL*	½	NL*	¾	40/20	¾
2	82 - 84.9	NL*	½	50/10	¾	30/30	1
3	85 - 87.9	NL*	¾	40/20	¾	30/30	1
4	88 - 89.9	NL*	¾	30/30	¾	20/40	1
5	> 90	50/10	1	20/40	1	10/50	1

* NL: no limit to work time per hour.
Note: The work/rest times and fluid replacement volumes will sustain performance and hydration for at least 4 hours of work in the specified heat category. Rest means minimal physical activity (e.g., sitting or standing) and should be accomplished in shade if possible. Individual water needs will vary by up to ¼ quart per hour. MOPP gear adds 10°F to WBGT index.

Caution: Hourly fluid intake should not exceed 1½ quarts.
Daily fluid intake should not exceed 12 quarts.

Field Study

A Prospective Study of Acute Respiratory Disease (ARD) in a Cohort of US Army Basic Trainees, October-November 1998, Fort Jackson, South Carolina

Adenoviruses have been recognized as major causes of acute respiratory disease (ARD) in military trainees for over four decades. With the use of effective adenovirus vaccines in this population since 1971, ARD rates were reduced by over 95% from pre-vaccine era highs, especially during the fall/winter months of peak adenovirus transmission.

During the vaccine-free fall/winter season of 1997, there were adenovirus-associated outbreaks of ARD at several Army and Navy basic training installations. Investigative reports and surveillance data from Fort Jackson, South Carolina, Great Lakes Naval Training Center, Illinois, and Fort Gordon, Georgia, demonstrated attack rates of adenovirus-associated ARD in affected units as high as 5-10% per week. During the 1997 adenovirus outbreaks, serotype 4 was the predominant strain at Forts Jackson and Gordon, and serotype 7 predominated at Great Lakes.

The cessation of adenovirus vaccine production, the lack of resupply in the foreseeable future, and the multifocal outbreaks during the 1997 ARD season motivated the conduct of a prospective cohort follow-up study of basic trainees at Fort Jackson, South Carolina, during the fall of 1998. The study assessed the epidemiology of ARD—particularly in regard to adenovirus infections—in a cohort of unvaccinated basic trainees and identified potential personal and environmental risk factors for adenovirus infection and disease.

Methods: During October and November 1998, all new accessions (n=678) to one training battalion at Fort Jackson, South Carolina, were monitored throughout their eight weeks of basic training. The study battalion consisted of three gender-integrated companies (designated companies A, C, and D) of about 225 trainees each. While the training was integrated, males and females lived and slept in segregated barracks. For study purposes, an ARD case was defined as a trainee who was hospitalized with respiratory symptoms during the training period. Viral isolates were serotyped using neutralization assays with reference antisera.

Results: There were 114 ARD-associated hospitalizations during the 8-week follow-up period. Peak ARD hospitalization rates occurred during the fifth week of training (figure 1). Attack rates (AR) in companies C (49 cases, AR=20.8%)

Figure 1. Acute Respiratory Disease cases, by week of initial entry training, Fort Jackson, SC, Oct-Nov 1998

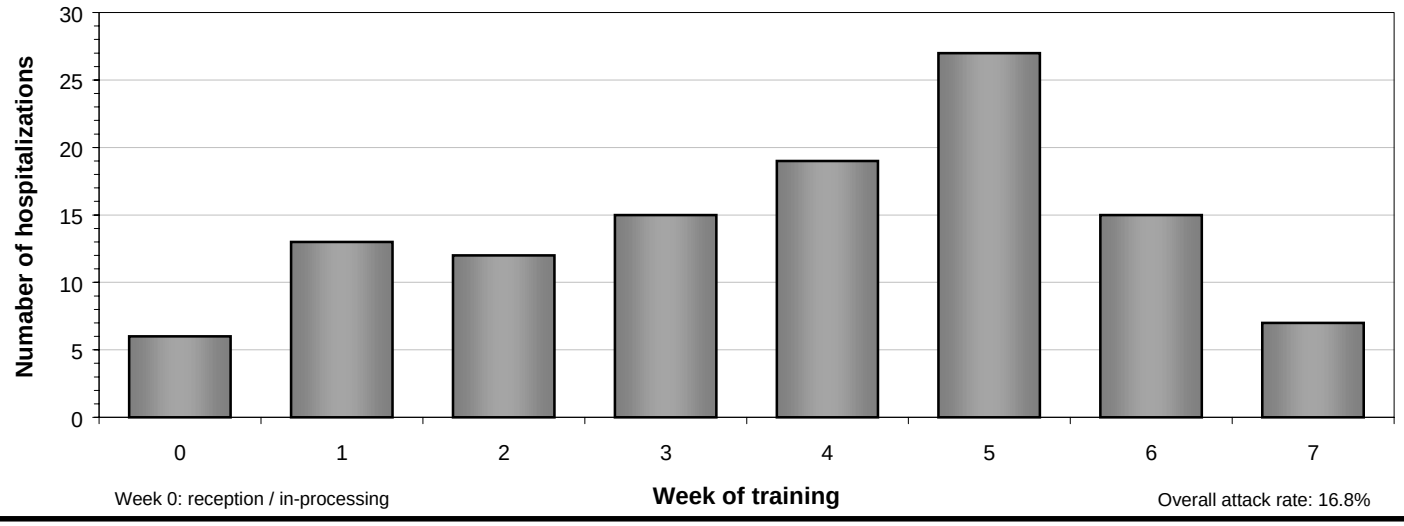
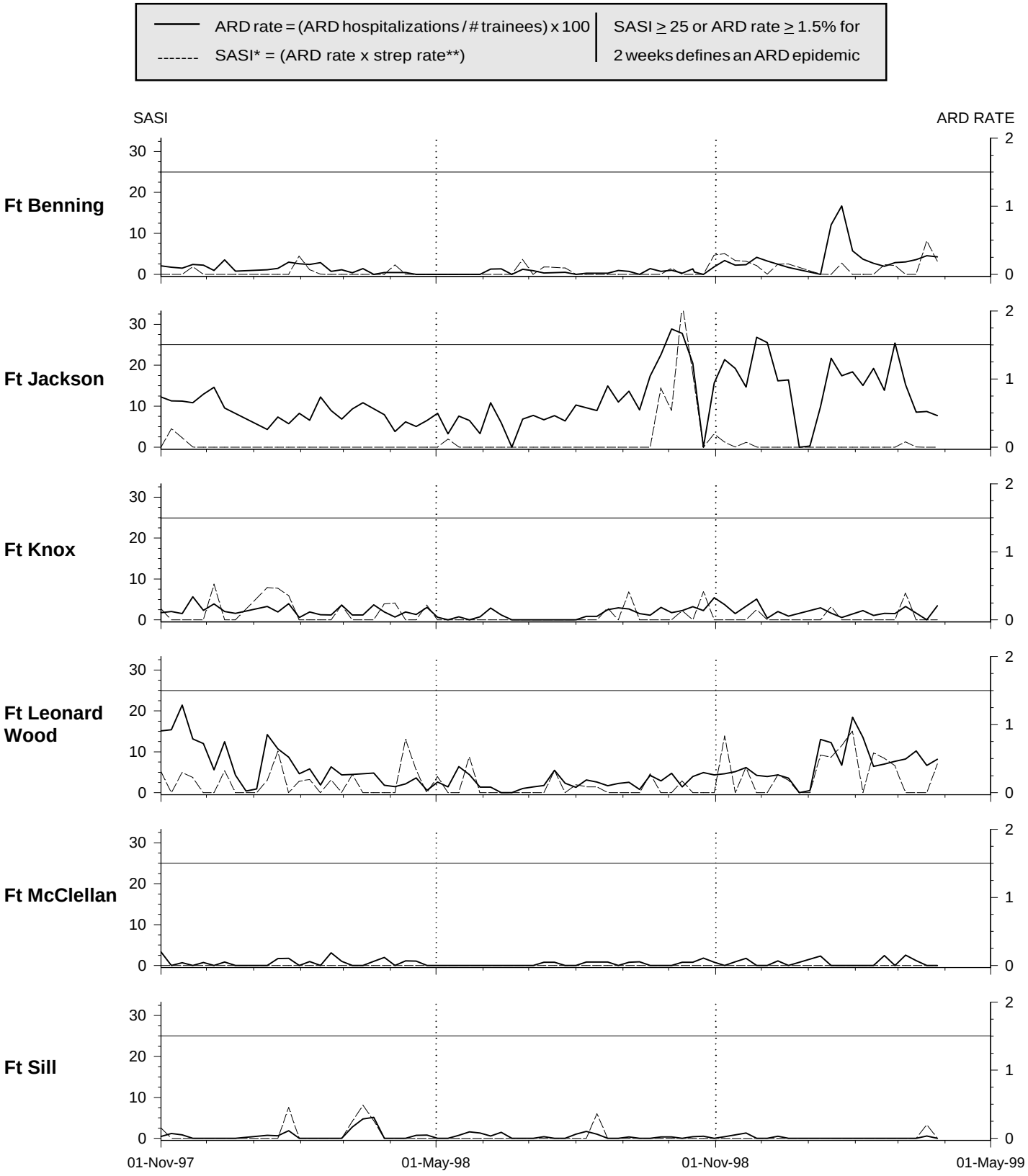


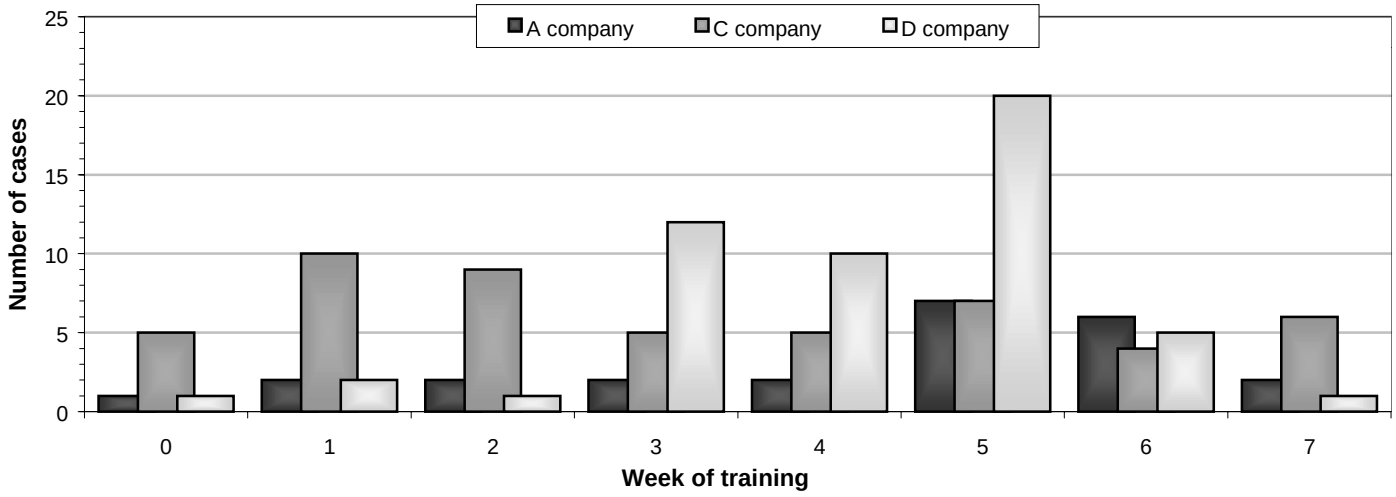
Figure III. Acute respiratory disease (ARD) surveillance update
US Army initial entry training centers



* SASI (Strep ARD Surveillance Index) is a reliable predictor of serious strep-related morbidity

** Strep rate = (Group A beta-hemolytic strep(+) / # cultures) x 100

Figure 2. Acute Respiratory Disease cases, by company and week of training, Fort Jackson, SC, Oct-Nov 1998



Week 0: reception / in-processing

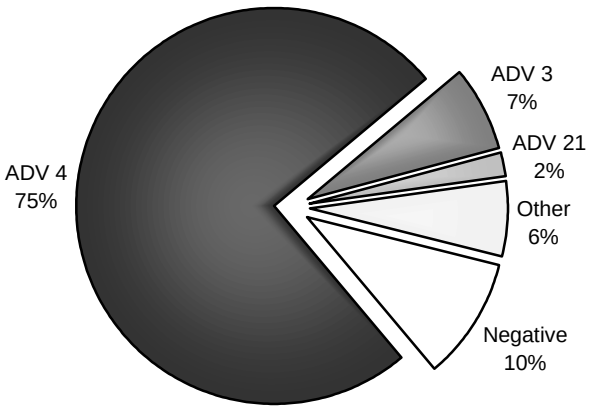
Overall attack rates: A company 11.0%, C company 20.8%, D company 17.8%

and D (43 cases, AR=17.8%) were nearly twice as high as in company A (22 cases, AR=11.0%) (figure 2). Attack rates among males (17.5%) and females (15.8%) were similar.

Specimens from 97 (85%) hospitalized cases were collected to attempt virus isolation. Adenovirus serotypes 4, 3, and 21 were isolated from 72%, 7%, and 2% of the specimens, respectively (figure 3). The results suggest that approximately 4 of 5 hospitalized ARD cases were infected with adenoviruses.

More than 90% of the trainees reported an acute respiratory illness sometime during their basic training, more than half reported fever in addition to respiratory symptoms, and approximately one-sixth were hospitalized with ARD (n=114, average length of hospitalization: 2.3 days). Finally, nearly half (46.6%) of all trainees missed some training due to an acute respiratory illness.

Figure 3. Virus isolates, ARD cases, basic trainees, Fort Jackson, SC, Oct-Nov 1998



Total specimens = 97

Editorial comment: This prospective study of basic trainees at Fort Jackson documents the ubiquitous nature of and the significant costs associated with acute respiratory illnesses among military trainees. Additionally, in the absence of vaccine-induced immunologic protection, adenoviruses have reemerged as the predominant pathogenic respiratory agents among trainees at Fort Jackson. Until vaccines are once again available, there is a need for other approaches to inhibit the spread and minimize the costs of adenovirus-associated ARD among trainees. To these ends, reduced crowding, increased barracks ventilation, and rigorous personal hygiene discipline may be beneficial.

Reported by Steven B. Cersovsky, CPT, MC, Leonard N. Binn, PhD, and Felicia D. Mitchell, BSc, Walter Reed Army Institute of Research; Shellie A. Kolavic, DMD, MPH, Christina S. Polyak, BSc, Jose L. Sanchez, COL, MC, US Army Center for health Promotion and Preventive Medicine; and William T. Bester, RN, Moncrief Army Community Hospital, Fort Jackson, SC

This is a corrected version of: Mortality trends among active duty military servicemembers 1990-1997, Vol. 5 No. 1, Jan/Feb 1999. The previous version inadvertently excluded data that should have been used in the summary.

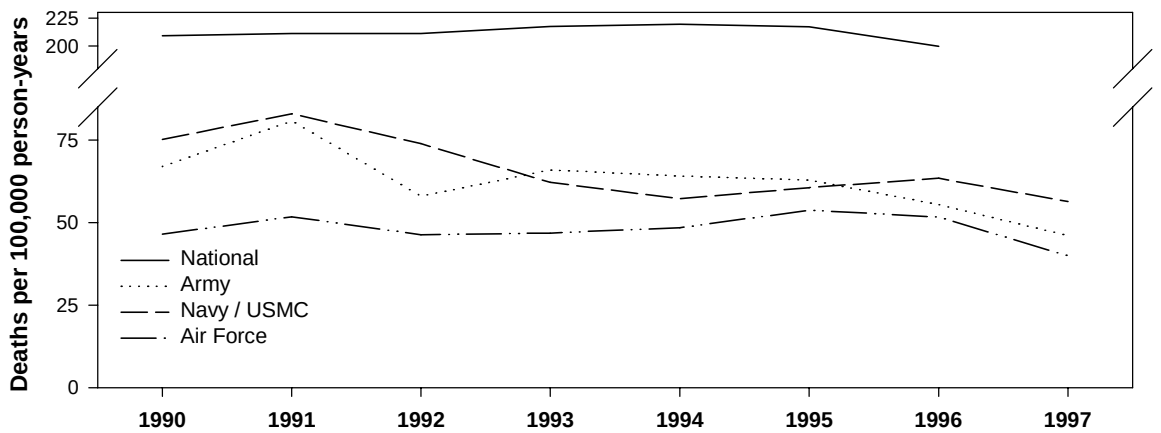
Mortality Trends Among Active Duty Military Servicemembers, 1990 - 1997

Military medical surveillance activities attempt to identify and characterize significant threats to the health, fitness, and operational effectiveness of military populations. In turn, deaths of active duty servicemembers are medical events of particular medical surveillance concern. This report summarizes the mortality experience of active duty servicemembers from 1990 through 1997.

Methods: The occurrence, nature, and circumstances of every death of an active duty servicemember are reported using Department of Defense (DoD) Form 1300, Report of Casualty. Casualty reports are forwarded through military service reporting channels to a central DoD archive maintained by the Directorate for Information Operations and Reports, Washington Headquarters Services, Washington, DC. To the extent possible, each death is classified as "accident," "self-inflicted," "homicide," "illness/disease," "hostile action/terrorism," or "other." Periodically, casualty files are transmitted to the Army Medical Surveillance Activity (AMSA) for inclusion in the data inventory of the Defense Medical Surveillance System (DMSS). This report summarizes deaths of servicemembers who were listed on contemporaneous active duty master files provided by the Defense Manpower Data Center. Mortality trends were assessed using linear regression procedures.

Results: From 1990 through 1997, 8,424 servicemembers died while on active duty (cumulative mortality rate: 61.0 per 100,000 servicemembers per year). Over the period, annual mortality rates declined by approximately 25%. The lowest mortality rates were consistently among Air Force members, while the most significant changes (average annual declines of approximately 4% per year) were among soldiers, sailors, and Marines. There were relative peaks in mortality in each of the services in 1991, the year of the Persian Gulf War (figure 1).

Figure 1. Mortality rates by year and service, active duty servicemembers, 1990 - 1997



More than half (54%) of all active duty deaths were attributable to accidents; of these, most involved motor vehicles. More than a fourth of all deaths resulted from intentional acts (suicide: 19%, homicide: 7%, hostile action and terrorism: 2%). Illnesses (16%) and other/undetermined circumstances accounted for the remainder. Mortality rates related to accidents, illnesses, and homicides declined by an average of 3-5% per year. Suicide rates increased through 1995 and then declined (figure 2).

Accidents: Among both males and females, accident-related death rates declined with age. In each age group examined, accident-related death rates were two to three times higher among males than females (table).

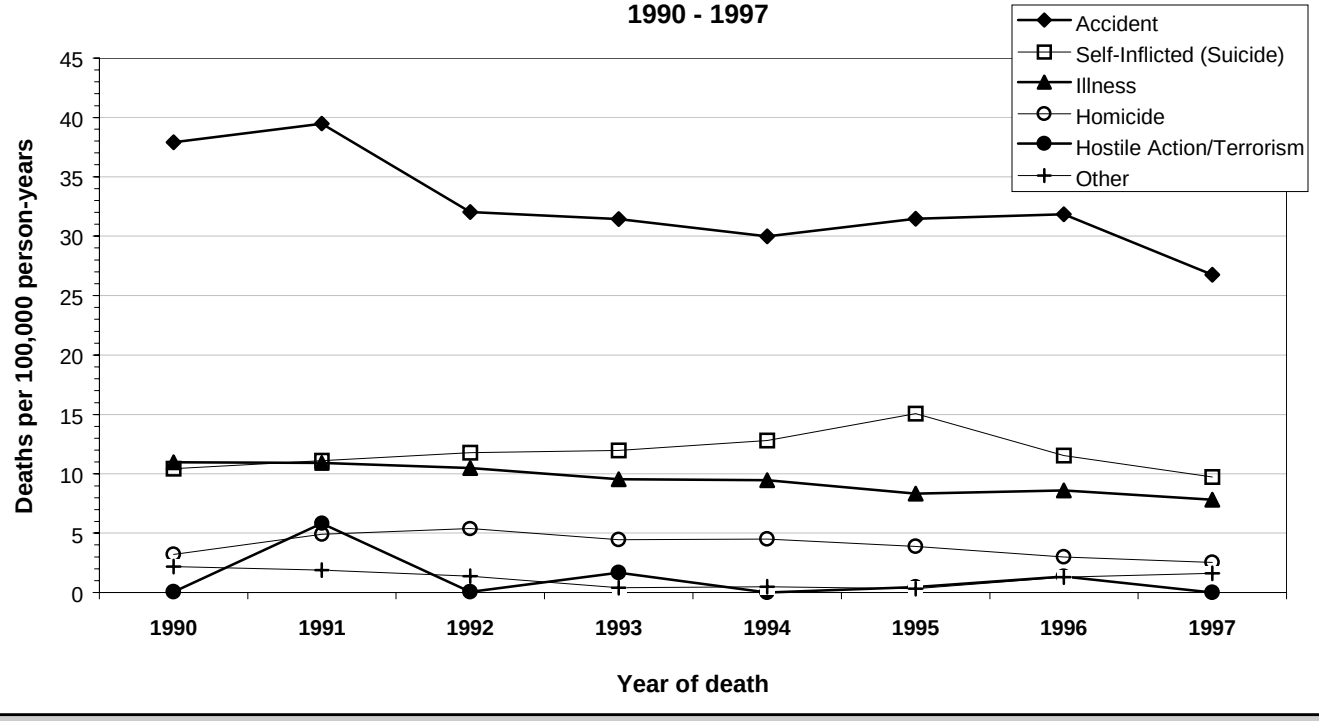
Suicides: Suicide rates declined with age among males but increased with age among females. Still, in each age group examined, suicide rates were two to three times higher among males than females (table).

Homicides: Female servicemembers between 25 and 34 years old (but not those younger or older) were victims of homicide at a higher rate than their male counterparts. Among male servicemembers (overall and in each age stratum), suicide rates were 2-5 times higher than homicide rates. In contrast, more female servicemembers died from homicide than suicide.

Illnesses: In all age groups, illness-related mortality rates were higher among males than females. Among both males and females, illness-related mortality increased sharply with age. For example, illness-related mortality rates were approximately five times higher among servicemembers older than 34 compared to those younger than 25.

Editorial comment: Between 1990 and 1997, mortality rates among active members of the US Armed Forces declined by an average of 3.5% per year. While military service is inherently stressful

Figure 2. Mortality trends, by manner of death, active duty servicemembers, 1990 - 1997



and at times dangerous, mortality rates among active duty military members were significantly lower than those in the general US population—overall (figure 1), by specific causes, and in every age- and gender-defined subgroup (table). This finding is not surprising since, for example, servicemembers are selected for military service based on their medical histories and states of health at the time of accession ("healthy worker effect"). In addition, all servicemembers have access to "free" state-of-the-art preventive and curative medical care and those who develop or manifest life threatening medical conditions are likely to be discharged from active service prior to their deaths (e.g., through medical disability retirement). At least partially as a result, military and national mortality rates differed most in relation to illness-related deaths. In summary, recent mortality experience suggests that (1) programs to enhance the health and safety of military servicemembers have been effective; and (2) military safety and health promotion programs should continue to emphasize accident and suicide prevention.

Reported by Abigail Garvey, MPH, and Samuel Washington, MPH, Army Medical Surveillance Activity.

Mortality rates* by age group, gender, and selected causes, active duty servicemembers and general US population, 1990 - 1997**

		Accident			Suicide			Homicide			Illness			Overall	
		Military		National	Military		National	Military		National	Military		National	Military	National
		n	Rate	Rate	n	Rate	Rate	n	Rate	Rate	n	Rate	Rate	Rate	Rate
Age < 25	Male	2,440	51.3	58.5	649	13.6	22.0	291	6.1	35.1	237	5.0	25.2	79.1	142.9
	Female	126	18.2	20.0	27	3.9	3.8	36	5.2	6.2	25	3.6	17.7	32.3	48.2
Age 25 - 34	Male	1,430	30.2	51.9	604	12.8	24.9	125	2.6	25.7	326	6.9	96.0	55.3	201.7
	Female	79	11.8	15.2	28	4.2	5.2	43	6.4	6.9	44	6.6	47.3	30.0	75.5
Age > 34	Male	464	17.5	46.6	300	11.3	23.5	58	2.2	14.0	663	25.1	345.0	57.9	432.3
	Female	23	7.9	15.1	15	5.2	6.8	4	1.4	4.1	40	13.8	194.4	29.7	221.4
	Total* **	**4,562**	**33.1**	**49.0**	**1,623**	**11.8**	**21.2**	**557**	**4.0**	**24.4**	**1,335**	**9.7**	**115.1**	**61.1**	**212.3**

* Rates are calculated per 100,000 person-years.

** National rates are based on 1990 - 1996 mortality data, age 15 - 54, National Center for Health Statistics.

*** National total rates are age-gender adjusted to the military population.

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